

# Robot-assisted ipsilateral ureteroureterostomy in a duplex system utilizing intraoperative flexible ureteroscopy

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## ABSTRACT

Iatrogenic injury to the ureter during pelvic surgery is an uncommon but well-documented complication. Accurate identification of the ureter during pelvic surgery is made far more complex in the presence of a duplex or ectopic system, an anomaly occurring in up to 2% of the population. In this article we present a technique for robot-assisted ipsilateral ureteroureterostomy for treatment of iatrogenic injury of a lower pole moiety ureter in a complete duplex system.

## Introduction

Ureteric duplication is the most common urological anatomical anomaly occurring in 0.7%–2% of the general population.<sup>1</sup> It is an autosomal dominant variation that is twice as common in females. Complete ureteric duplication occurs when two separate ureteric buds arise from the mesonephric duct, migrate to meet the metanephros and bifurcate into two separate collecting systems.<sup>2</sup> Many duplicated collecting systems remain asymptomatic and are considered a normal anatomical variant. These may be identified incidentally at the time of medical imaging, surgical intervention, and at times unexpectedly following inadvertent transection. Iatrogenic injury to the ureter is a known risk of all pelvic surgery with the greatest risk being in gynaecological surgery. It is intuitive to think however, that risk of ureteric injury is increased in patients with ureteric duplication. We present the case of a 61-year-old woman found to have a ureteric injury in a duplex system identified 3 weeks following elective oophorectomy.

## Case presentation

A 61-year-old woman with no prior history of ureteric obstruction, reflux or urinary tract infection underwent an elective left oophorectomy for a large borderline serous ovarian lesion. She had a past medical history of type 2 diabetes, hypertension and hyperlipidaemia with baseline eGFR of >90.

Three weeks post-operatively she presented with nausea, vomiting

and abdominal distention. Computerised tomography demonstrated a large left sided pelvic collection causing partial small bowel obstruction. The collection was confirmed to be urinoma on delayed phase imaging (Fig. 1). A complete duplex system was confirmed on the left, the lower moiety ureter seen to abruptly stop at the pelvic brim, level with the collection. The upper moiety ureter was seen to be travelling intact down to the bladder. Following ultrasound guided insertion of a drain tube, rigid cystoscopy and ureteroscopy was performed confirming contrast extravasation into the collection and inability to pass a wire up into the lower moiety. The upper moiety was stented uneventfully and a percutaneous nephrostomy tube was inserted into the lower moiety.

In the interim, the patient was diagnosed with breast cancer and underwent total mastectomy and lymph node dissection with subsequent hormonal therapy. Until decision regarding potential need for further chemoradiotherapy was decided, definitive management of the ureteric injury was postponed.

Nine months following injury, the patient was booked for robotic-assisted laparoscopic uretero-ureterostomy. The patient was positioned in lithotomy, and the Da Vinci Xi robotic system was docked laterally. Using routine port placement, the peritoneum was incised. The gonadal vessels were identified and swept medially. The duplex ureters were identified and found to be travelling within the same sheath. At this point, a flexible ureteroscope was introduced simultaneously in order to identify the intact upper moiety ureter (Fig. 2a). Once all key landmarks were identified, the injured lower pole moiety ureter was spatulated, maintaining a small inferior island intact to allow stability

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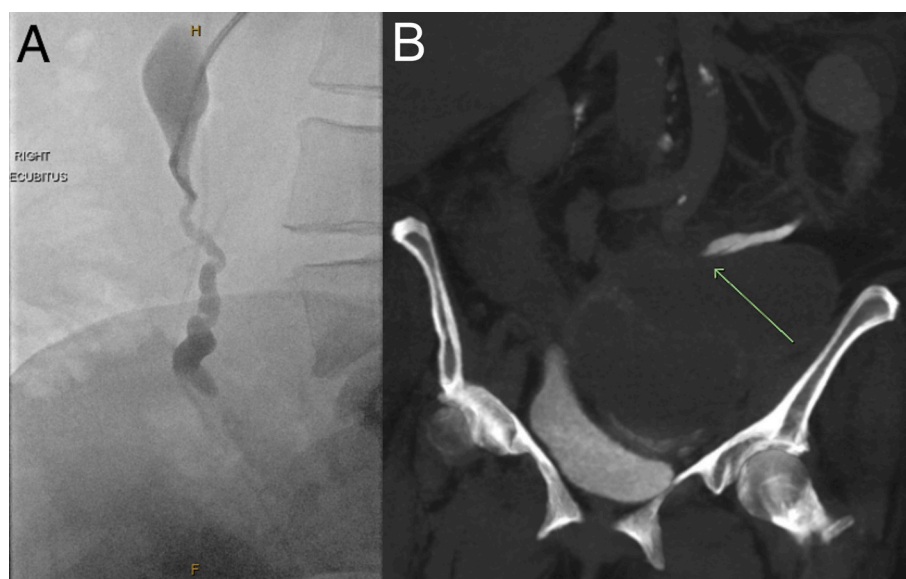
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**Fig. 1.** Left: Nephrostogram, lower moiety, demonstrating abrupt cessation of flow at pelvic brim. Right: CT IVP demonstrating point at which lower moiety ureter abruptly ceases and large associated urinoma.

(Fig. 2b). The intact upper moiety ureter was incised longitudinally and an end-to-side anastomosis was performed. In a retrograde fashion, a sensor wire was passed up the upper moiety ureter and then guided into the proximal end of the lower moiety ureter robotically, traversing the anastomosis. A 4.8Fr double J stent was passed over the wire and seen to be in position on imaging intensifier prior to completing the anastomosis and closure (Fig. 2c).

Post-operative recovery was uneventful. The left nephrostomy tube was removed day 3 post-operatively. A follow-up ureteroscopy was performed at 8 weeks which demonstrated a well healed patent anastomosis (Fig. 3). The patient's renal function was preserved with eGFR >90.

## Discussion

Robot-assisted ureteroureterostomy for repair of iatrogenic injury to the ureter in a complete duplex system is an effective way of reinstating renal tract continuity. It is a preferable option over alternatives such as hemi-nephrectomy and nephrectomy as it allows for preservation of the otherwise healthy kidney. In the presented case, due to pre-existing poor function of the upper moiety, reinstatement of continuity of the lower moiety was imperative in preserving long-term renal function.

Operative techniques regarding duplex ureters are discussed extensively within paediatric urology, being a common procedure for lower pole vesicoureteric reflux or upper pole obstruction.<sup>2</sup> Robotic ureteroureterostomy has been developed as a successful minimal invasive technique in this field.<sup>3</sup> With regard to adult populations however, case reports describing similar techniques for treatment of iatrogenic ureteric injury are rare.<sup>4,5</sup>

Delayed repair of the ureteric system allowed for medical optimization of our patient, and the large urinoma had completely resolved with the use of nephrostomy diversion and percutaneous drainage. Our dissection was performed proximally away from the injury site in order to avoid potential areas of inflammation and poor dissection planes. Particular attention was paid to the blood supply to the duplex ureters. Although adequate dissection was required for identification of structures and anastomosis formation, care was taken to preserve the blood supply to the ureters thus reducing risk of ischaemia.

## Conclusion

Robotic ureteroureterostomy is a safe and efficient technique for minimally invasive complex ureteral reconstruction. Although uncommon, it is important for surgeons who operate in the pelvis to be aware of potential anatomic aberrations, not only intra-operatively but also in the post-operative period when complications present.

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## Consent

Obtained.

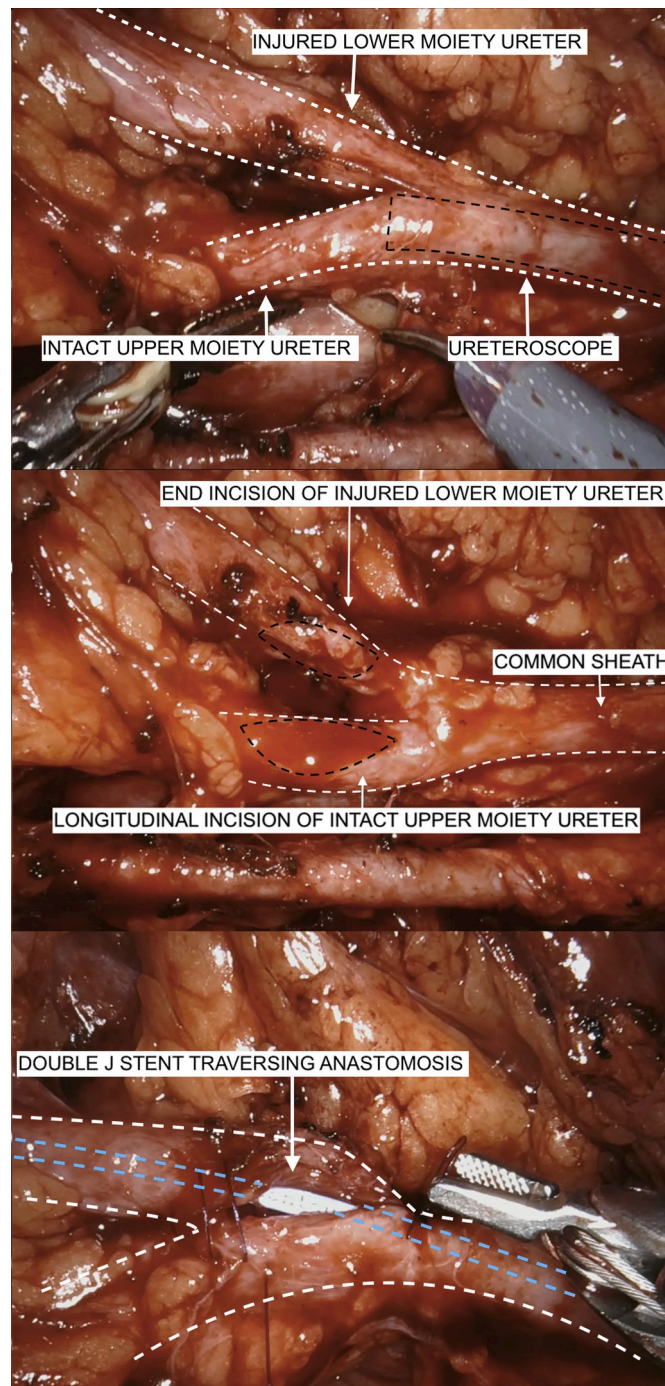
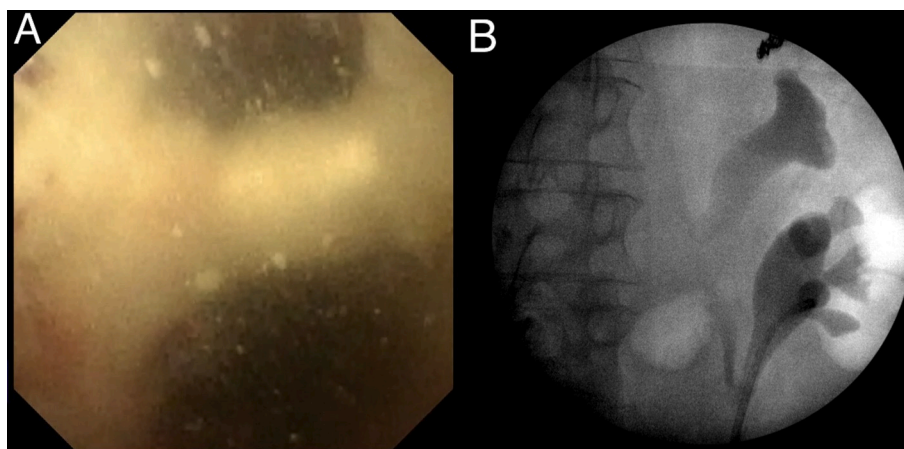


Fig. 2. Intra-operative technique for robotic-assisted ipsilateral ureteroureterostomy.



**Fig. 3.** Uretero-ureterostomy anastomosis at 8 weeks post-operatively. A) Photo at ureteroscopy. B) Retrograde pyelogram.

#### Author contribution

EO: Conceptualization; Investigation; Supervision; Visualization; Roles/Writing - original draft. JT: Conceptualization; Investigation; Writing - review & editing. NL: Conceptualization; Investigation; Supervision; Writing - review & editing.

#### Declaration of competing interest

None.

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